

Supplementary material

Table S1 Univariate analysis for clinical predictors of detectable IgG antibodies against nucleocapsid-protein of SARS-CoV-2 in liver transplant patients

	OR	95% CI	p-value
Age (years)	1.073	1.008 – 1.143	0.028
Male gender	0.205	0.036 – 1.175	0.075
Time from infection to serology (weeks)	0.992	0.794 – 1.239	0.943
Time from transplantation to serology (years)	1.041	0.911 – 1.189	0.557
Hypertension	1.875	0.309 – 11.372	0.494
Chronic kidney disease	0.833	0.131 – 5.297	0.847
Calcineurin inhibitors	0	0	
Mycophenolate	0.300	0.054 – 1.653	0.167
mTOR inhibitors	0	0	
Steroids	0.222	0.036 – 1.390	0.108
≥2 immunosuppressive agents	1.000	0.188 – 5.332	1.000
ACE inhibitors/ARB's	1.184	0.192-7.320	0.856
PSC/PBC/AIH	0.048	0.006 – 0.366	0.003
Positive IgG anti-spike antibodies	0	0	
Presence of neutralizing ability	67.500	5.099-893.366	0.001

Abbreviation list: OR, odds ratio; 95% CI, 95% confidence interval; PSC, primary sclerosing cholangitis; PBC, primary biliary cholangitis; AIH, auto-immune hepatitis; mTOR, mammalian target of rapamycin; ACE, angiotensin converting enzyme.

Table S2 Univariate analysis for clinical predictors of presence of neutralizing ability of antibodies against SARS-CoV-2 in liver transplant patients

	OR	95% CI	p-value
Age (years)	1.038	0.978-1.102	0.215
Male gender	0.130	0.019 – 0.890	0.038
Time from infection to serology (weeks)	1.088	0.828-1.430	0.545
Time from transplantation to serology (years)	0.986	0.871-1.117	0.827
Hypertension	4.062	0.420-39.257	0.226
Chronic kidney disease	1.905	0.192-18.928	0.582
Calcineurin inhibitors	0	0	
Mycophenolate mofetil	1.053	0.164-6.776	0.957
mTOR inhibitors	0	0	
Steroids	0.417	0.059-2.934	0.379
≥2 immunosuppressive agents	0.306	0.048-1.954	0.210
ACE inhibitors/ARB's	2.632	0.269-25.715	0.405
PSC/PBC/AIH	0.080	0.011-0.590	0.013
Positive IgG anti-nucleocapsid antibodies	67.5	5.099-893.633	0.001
Positive IgG anti-spike antibodies	0	0	

Table S3: Characteristics of the patients with negative anti-nucleocapsid IgG antibodies in the study group

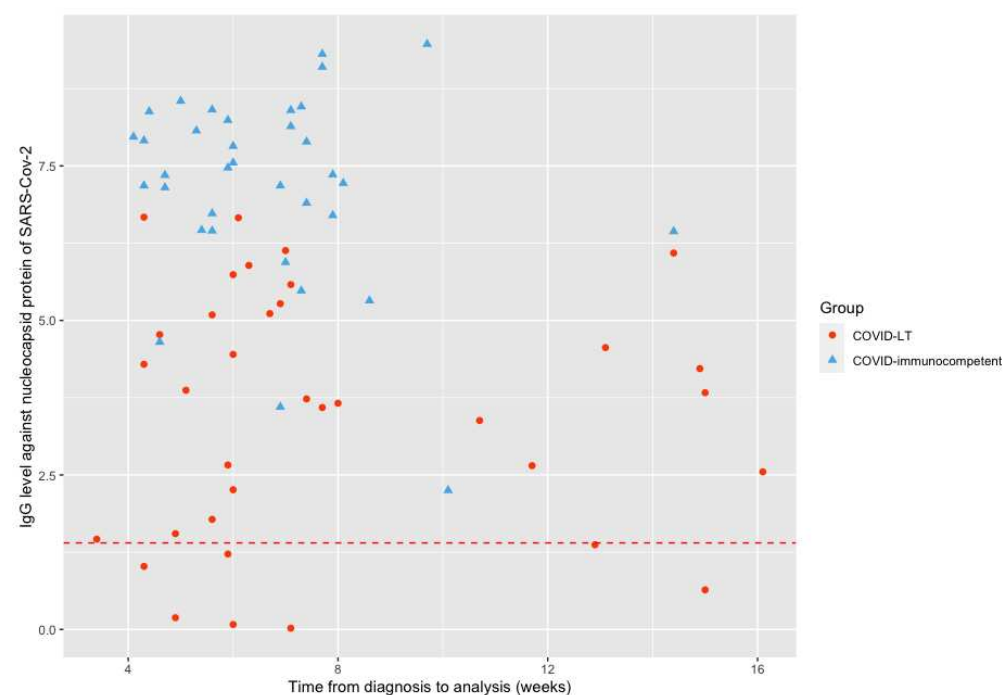
Underlying liver etiology	Time from infection to serology (weeks)	Time from transplantat ion to serology (y)	Immunusupp-ressive agents	Symptoms COVID-19	IgG against nucleocapsid protein	Total Ig against spike protein	Neutralizing antibodies against SARS-Cov-2
PSC	7.1	0.6	Tacrolimus	None	Negative (0.02)	Negative (0.043)	Negative
Polycystic liver disease	12.9	6.5	Tacrolimus, Mycophenolate, steroids	Conjunctivitis, anosmia/dysgeusia	Negative (1.37)	Positive (18.26)	Positive (60)
Cryptogenic cirrhosis	15.0	21.4	Tacrolimus	Fever, cough, fatigue, anosmia/dysgeusia	Negative (0.64)	Positive (18.26)	Negative
AIH	5.8	0.3	Tacrolimus, Mycophenolate, Steroids	Sneezing	Negative (1.22)	Positive (17.05)	Positive (10)
AIH	4.3	0.9	Tacrolimus, Steroids	None	Negative (1.02)	Positive (18.3)	Negative
PSC	4.9	5.6	Tacrolimus, Mycophenolate	Fatigue	Negative (0.19)	Positive (17.0)	Negative
PBC	6.0	7.4	Tacrolimus, Mycophenolate	Cough, fatigue, diarrhea, headache	Negative (0.08)	Positive (18.26)	Negative

Case	Sex (m/f)	Age (y)	BMI, kg/m ²	Comorbidity
1	m	24	23.5	-
2	m	56	19.7	Hypertension, chronic kidney disease
3	f	29	21.1	-
4	f	33	20.9	-
5	M	55	24.6	-
6	f	49	24.6	History of HCC
7	F	73	18.2	Hypertension, chronic kidney disease

Abbreviation: HCC, hepatocellular carcinoma; PSC, primary sclerosing cholangitis; PBC, primary biliary cholangitis; AIH, autoimmune hepatitis.

Figure S1: A) IgG levels against nucleocapsid-protein and B) total-Ig levels against spike-protein in relation to time since COVID-19 diagnosis in the COVID-LT cohort and in COVID-immunocompetent cohort

A)



B)

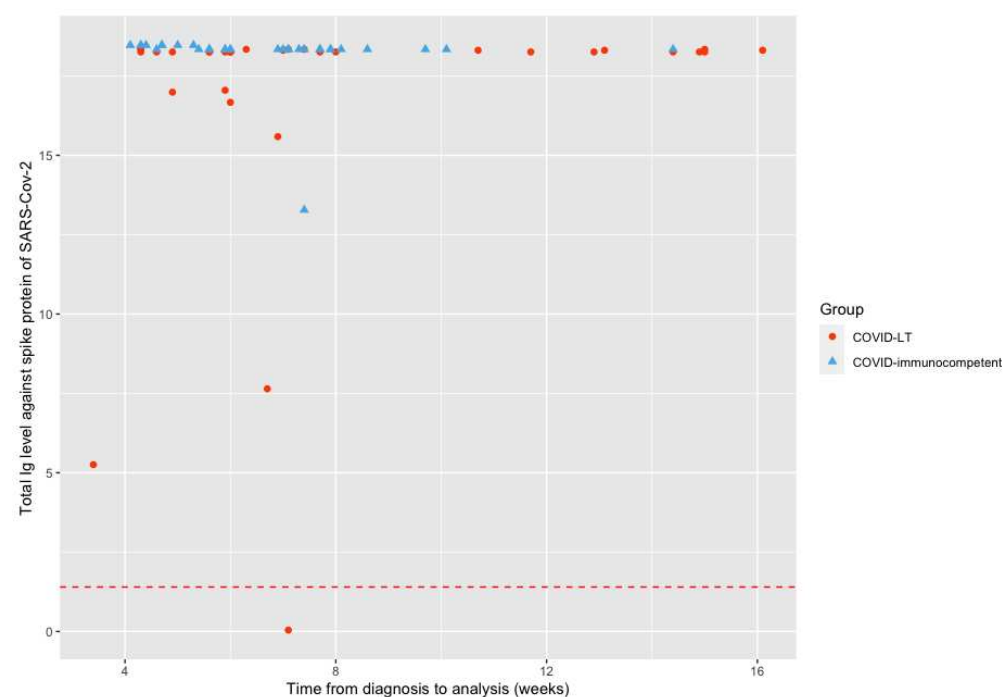
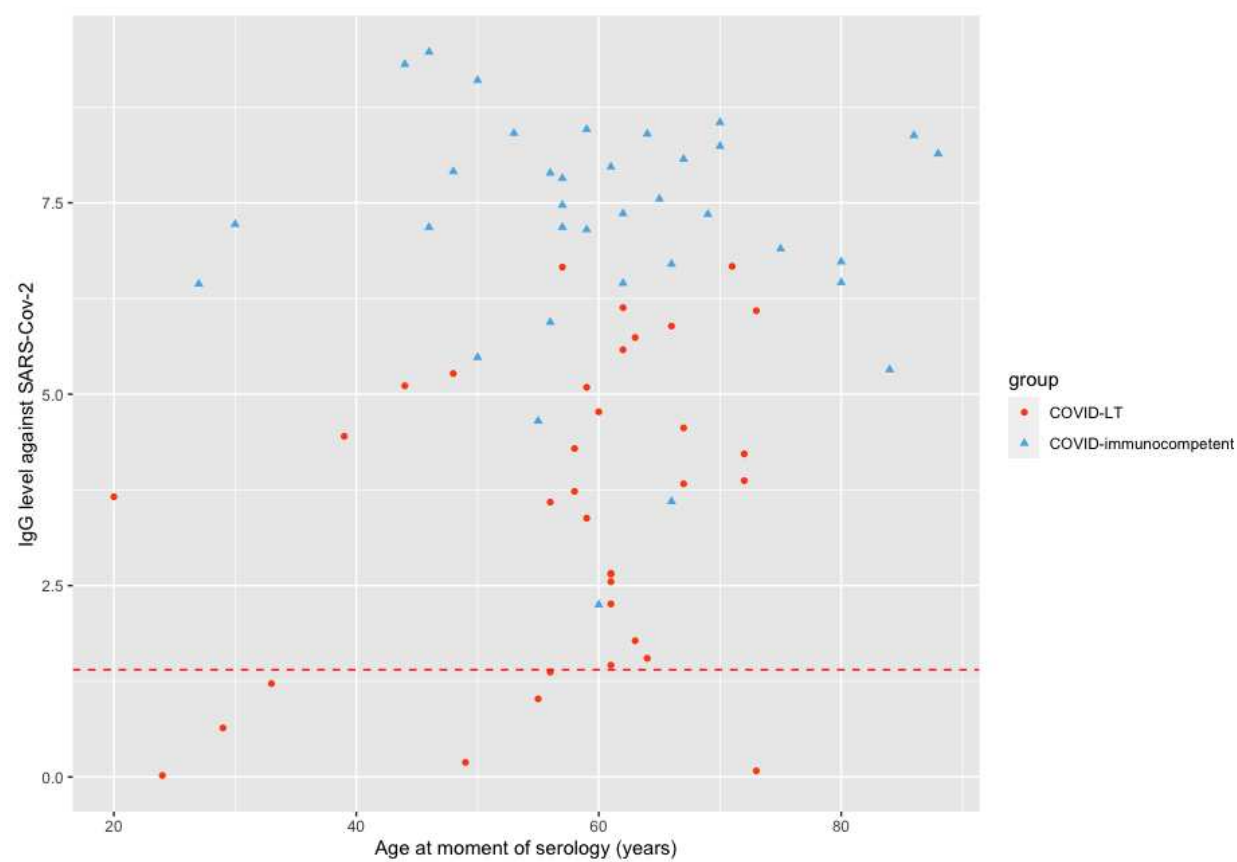


Figure S2: IgG level against nucleocapsid-protein according to age in the COVID-LT cohort and in COVID- immunocompetent cohort



Appendix A. Questionnaire to rule out COVID-19 symptoms in the non-COVID LT cohort.**Inventory of symptoms and risk for Corona**

PART 1

General

1. What is your height?

..... cm

2. What is your body weight?

..... kg

3. Did you receive a seasonal flu shot last year?

☐ Yes ☐ No ☐ I do not know

Live and work

1. How many members are in your household (yourself included)?

.....

1a. How many members in your household are in the age of 0-12 years?

.....

1b. How many members in your household are in the age of 13-17 year?

.....

1c. How many members in your household are in the age of 18-29 year?

.....

1d. How many members in your household are in the age of 30-59 year?

.....

1e. How many members in your household are over the age of 60 year?

.....

2. Do you currently work outdoors?

☐ Yes ☐ No

3. Did you work during de peak of the corona outbreak outdoors?

☐ Yes ☐ No

4. Do you work in healthcare?

☐ Yes ☐ No

5. Is one of your household members still working outdoors?

☐ Yes ☐ No

6. Is one of your household members working in healthcare?

☐ Yes ☐ No

PART 2

*The following questions are related to the period of time after the outbreak of the novel corona virus in **February 2020**.*

Travel

1. Did you travel abroad in the past few months?

☐ Yes ☐ No (*proceed tot he next heading 'Contacts'*)

1a. Which country(s) did you visit?

.....

.....

1b. Was there a travel warning during your stay abroad? (as advised by the government)

☐ Yes ☐ No

Contacts

1. Has one of your household members been tested positive for corona?

☐ Yes ☐ No

2. Did a physician tell one of your household members that he/she probably is/was infected with the corona virus?

☐ Yes ☐ No

3. Did you have close contact with someone who was tested positive for corona?

This is about physical meetings, not about meetings on the phone.

☐ Yes ☐ No, as far as I know

Corona related symptoms

1. How do you consider your health in general?

☐ Excellent

☐ Very good

☐ Good

☐ Fair

☐ Poor

2. Did you suffer from corona-related symptoms in **the last few months since February**?

☐ Yes ☐ No (*proceed to the next heading 'Diagnose Corona'*)

2a. From which symptom(s) did you suffer? Provide an estimate of the amount of days for each symptom.

☐ Coughing, days

☐ Sneezing, days

☐ Running nose, days

☐ Shortness of breath during exercise, days

☐ Shortness of breath without exercise, days

☐ Sore throat, days

☐ Fever ($> 38^{\circ}\text{C}$), days

☐ Chest pain, days

☐ Diarrhea, days

☐ Nausea, days

☐ Vomit, days

☐ Abdominal pain, days

☐ Sore muscles, days

☐ Joint pain, days

☐ Red, painful or itchy eyes, days

☐ Fatigue, days

☐ Loss of smell or taste, days

☐ Headache, days

Diagnose Corona

1. Have you been tested for the Coronavirus?

☐ Yes ☐ No (*proceed to question 2*)

1a. On what date did you receive the corona test (dd/mm/yyyy)?

.....

1b. What was the test result of the Coronatest?

☐ Positive ☐ Negative ☐ I do not know

2. Did a physician tell you that you probably have/had corona?

☐ Yes ☐ No

3. If you had to choose, would you say that you have/had corona?

☐ Yes,
because.....
.....

☐ No

4. Have you been admitted to the hospital due to corona?

☐ Yes ☐ No

THANK YOU FOR YOUR PARTICIPATION

Please hand in this questionnaire to your treating physician.